Illness perception clusters and relationship quality are associated with diabetes distress in adults with Type 2 diabetes

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Title: Illness Perception Clusters and Relationship Quality are Associated with Diabetes Distress in Adults with Type 2 Diabetes.

Abstract

This report aims to augment what is already known about emotional distress in Type 2 diabetes by assessing the predictive value of illness perception clusters and relationship quality on each of the four subcategories of Diabetes Distress. Individuals with Type 2 diabetes were recruited through the databases of 5 General Practices across Northern Ireland. They received a postal questionnaire which measured demographic and clinical parameters, and incorporated 4 scales; Beck's Depression Inventory (BDI), Diabetes Distress Scale 17 (DDS-17), Revised Illness Perception Questionnaire (IPQ-R), and the Revised Dyadic Adjustment Scale (RDAS). Long-term blood glucose (HbA_{1c}) was retrieved through the participants' General Practitioner. Participants (*n*= 162) had a mean age of 68 years and had an average illness duration of 10 years. Three illness perception clusters emerged from the data, which captured three subgroups of participants sharing similar illness perception schemas. Regression analyses were performed across each DDS-17 subscale, with participant demographics, illness perception clusters, and relationship variables entered into three blocks. The emotional burden subscale produced the strongest model overall, with demographics, illness perception clusters, and relationship quality explaining 51.1% of variance in emotional burden. Covariates accounted for 41% of the variance in regimen-related distress, 20% of the variance in interpersonal distress, and 8.6% of the variance in physician-related distress. Cluster membership was strongly associated with emotional burden, regimen-related distress, and to a lesser degree interpersonal distress, but was not associated with physician-related distress. Relationship quality significantly predicted all four subcategories of diabetes distress, however most strongly predicted regimen-related distress. Illness perception schemas and interpersonal issues have important influences on emotional adjustment in Type 2 diabetes. This study provides direction for the content of a novel, multifaceted approach to identifying and reducing diabetes distress in people with Type 2 diabetes.

Keywords: Type 2 Diabetes Mellitus, Emotional Adjustment, Illness Perceptions, Interpersonal Relations.

Introduction

Diabetes distress refers to the understandable, but significant emotional distress which is directly related to having diabetes. This distress may relate to control over the diabetic regimen, worries and fears about long-term outcomes, tensions among families, and/ or feeling unsupported by health professionals (Polonksy et al 2005). Diabetes distress is distinct from clinical depression, due to its specificity to diabetes self-care (Fisher, Gonzalez & Polonsky 2014); though it can be easily misdiagnosed as depression when assessed by less sensitive, survey-based measures of depression (Fisher et al 2007). Research shows that diabetes distress, however *not* depression, is associated with long term blood glucose (HbA_{1c}) (Strandberg et al 2015, Fisher, Hessler, Polonsky & Mullan 2012, Fisher et al 2010, Islam, Karim, Habib & Yesmin 2013), which demonstrates its bearing on long-term clinical outcomes. However, there is an acknowledged overlap between depression and diabetes distress. For example evidence demonstrates a cyclical relationship between diabetes distress and depression (Burns, Deschênes & Schmitz 2015), and has shown that increased diabetes distress over time could be a precursor to depression (Hosoya, Matsushima, Nukariya & Utsunomiya 2011).

Among individuals with Type 2 diabetes, illness perceptions (beliefs) contribute as much as 34% to the variance in diabetes distress (Paddison & Alpass 2007). More specifically illness perceptions relating to diabetes consequences are associated with poorer emotional wellbeing (Hudson, Bundy, Coventry & Dickens 2014), and personal control mediates the relationship between diabetes distress and HbA_{1c} (Gonzalez, Shreck, Psaros & Safren 2015). Clustering individuals with Type 2 diabetes according to shared illness perception schemas is also shown to provide a useful predictor of depression overtime (Skinner et al 2011); however it is not yet known whether shared illness perception schemas predict diabetes distress.

A person's social environment has an important influence on emotional adjustment to Type 2 diabetes. Poor relationship quality is related to less personal integration of diabetes and maladaptive self-care behaviours (e.g. poor dietary choices) in persons with type 2 diabetes (Dempster, McCarthy & Davies 2010), and differences in adjustment among couples influences adherence to a healthy diet (Miller & Brown 2005).Similarly overprotectiveness of partners (Johnson et al 2015) and perceived level of support from family members (Karslen & Bru 2014) are significantly associated with diabetes distress. Despite compelling evidence

about the role of significant others in adjustment to diabetes, the influence of relationship quality specifically on diabetes distress remains unclear.

Rationale

This report aims to:

1. Investigate the predictive influence of illness perception clusters across each subscale drawn from the Diabetes Distress Scale-17 (Polonksy et al 2005).
2. Investigate the predictive value of relationship quality relative to the illness perception clusters which emerge.

Method

Participants and Measures

Participants were recruited using the databases of five General Practices in Northern Ireland. Nine-hundred and fifty adults with a diagnosis of Type 2 Diabetes were posted out a questionnaire containing the following outcome measures: *Demographics and Clinical Parameters* (Gender, age, ethnicity, time of diagnosis, diabetes treatment (medication/ insulin), diabetes complications, partner has/has not got diabetes); the *Diabetes Distress Scale-17 (DDS-17)* (Polonksy et al 2005); the *Revised Illness Perception Questionnaire (IPQ-R)* (Moss-Morris et al 2002); the *Revised Dyadic Adjustment Scale (RDAS)* (Busby, Christensen, Crane & Larson 1995); and *Beck's Depression Inventory (BDI)* (Beck, Steer & Brown 1996). Glycated haemoglobin (HbA_{1c}) was accessed via consenting participants' general practitioner/doctor.

Statistical analysis (SPSS version 21)

Hierarchical cluster analysis was performed on the IPQ-R using Ward's Method of analysis with squared Euclidean distance as the similarity measure. Identified clusters and cluster centroids were entered into K-Means analysis with iteration and classification, which lead to the ultimate clustering of participants. Separate hierarchical regression analyses (with backward elimination) were performed across each diabetes distress subscale.

Results

One hundred and sixty-two completed questionnaires were received. The majority of participants were male (66%), white (98.1%), with an average age of 68 years. On average the sample had a low rate of diabetes-related complications (11%) and relatively well-controlled HbA_{1c} (53.5mmol/mol) (NICE guidelines state ≤53 mmol/mol is within normal range for people with diabetes). See Table 1 for full descriptives.

On average participants had low levels of diabetes distress (≤2 (Polonksy et al 2005)), however approached the parameter for moderate distress on regimen-related distress (1.9) and emotional burden (1.8). On average, participants scored below the threshold for borderline depression (>17 (Beck et al 1996)). To elucidate the relationship between diabetes distress and depression in the present sample, we performed Pearson's correlations on depression and each diabetes distress subscale (Table 2). The correlations demonstrate weak to moderate, significant positive correlations, ranging from .29-.70. This suggests that although a relationship is present, there is a degree of discrepancy between the two measures of emotional distress.

Do subgroups of individuals with Type 2 diabetes share similar illness perception schemas?

Three clusters emerged. Cluster 1 (n=23) represents individuals who believe that their diabetes has severe consequences on day to day life, who have a strong experience of diabetes symptoms, and feel that these symptoms are unpredictable. This group felt that they could not adequately control their diabetes. Cluster 2 (n=68) identifies individuals who do not have a strong experience of diabetes symptoms, and any symptoms experienced are perceived as infrequent. This group do not believe that the diabetes has severe consequences on daily life and believe that they are able to effectively influence their diabetes. Cluster 3 (n=71) represents individuals who do not have a strong experience of diabetes symptoms, but who believe that their diabetes is a serious and long-lasting condition.

Table 3 displays mean difference scores for each cluster across all variables. Cluster 1 scored significantly higher across all diabetes distress subscales (reaching above the threshold for diabetes distress), and a greater incidence of diabetes complications and depression. There

was also a trend for lower relationship quality, and poorer HbA_{1c} control in cluster 1 when compared with cluster 2 and 3. Cluster 2 members scored substantially lower on diabetes distress when compared with cluster 1 and (to a lesser extent) 3.

What is the predictive value of illness perception clusters and relationship quality on each diabetes distress subscale?

The emotional burden subscale produced the strongest model, with covariates explaining 51.1% of the variance [adjusted R^2=51.1%; F(9,68)=8.895; p<.001]; 38% of which was explained by cluster membership; 10% by participant demographics; and 3.1% by relationship quality. Covariates accounted for 41% of the variance in regimen-related distress [adjusted R^2=41%; F(8,95)=9.243; p<.001]; 15.8% of which was explained by cluster membership; 5% by demographics; and 20.2% relationship quality. Covariates explained 20% of the variance in interpersonal distress [adjusted R^2=20%; F(7,67)=3.40; p=.004]; 14.7% of which was explained by cluster membership; 0% by demographics; and 5.3% relationship quality. Covariates explained 8.6% of the variance in physician-related distress [adjusted R^2=8.6%; F(7,95)=2.273; p=.036]; 0% of which was explained by cluster membership; 4.9% by demographics; and 3.7% relationship quality. See Table 4 for regression outputs.

Discussion

This study identifies three distinct clusters of people who share similar illness perception schemas. Expanding on the work of Skinner et al (2011), our findings validate the use of illness perception schemata for identifying those most at risk of elevated diabetes distress (principally on aspects of emotional burden and regimen-related distress). Cluster 1 members had the highest levels of diabetes distress and scored higher on depression, while cluster 2 scored the lowest on both measures. This supports previous work demonstrating that elevated diabetes distress may increase one's risk of developing clinical depression if unaddressed over a prolonged period of time, or conversely; unaddressed depression may exacerbate distress specific to ones diabetes (Hosoya et al 2011).

Relationship consensus strongly predicted regimen-related distress and emotional burden. This suggests that greater communication problems and disagreements may reduce a person's ability to effectively manage their diabetes, diminish emotional resilience, and may also

reduce feelings of being supported with self-management. Relationship cohesion predicted physician-related distress, which suggests that couples that do not often take part in activities or tasks together, also may not engage with diabetes health services together; which may increase the emotional strain for the person with diabetes.

Evidence demonstrates that illness perceptions (Ebrahimi, Sadeghi, Amanpour & Vahedi 2016) and interpersonal issues (García-Huidobro, Bittner, Brahm, & Puschel 2011) can be pragmatically targeted through intervention, and therefore our findings provide some amenable content for an intervention to reduce diabetes distress.

Participants in this study had relatively well-controlled HbA_{1c}, with low levels of diabetes distress and diabetes complications. This is likely because the sample was drawn from a primary care setting however may impede the representativeness of the sample. Thus focusing on more emotionally "distressed" samples in future work would be beneficial. The low response rate from the survey (<20%) means that any results drawn from this study should be interpreted with caution, and we recommend that further work be undertaken in a larger cohort, controlling for non-response bias. In closing, this work demonstrates how illness schemas and interpersonal issues may influence different aspects of diabetes distress, and provides some direction for the design of a multifaceted intervention which addresses cognitive and interpersonal conflicts in tandem.

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Table 1: Participant Demographics and Clinical Parameters

	Persons With Type 2 Diabetes (n=162)
Gender (N) (%)	
- Male	107 (66%)
- Female	55 (34%)
Age (av. years) (SD)	68.29 (10.84)
Ethnicity (N) (%)	
- White	159 (98.1%)
- Irish Traveller	-
- Mixed/Multiple ethnic groups	-
- Asian/Asian British	1 (0.6%)
- Black/African/Caribbean/Black British	2 (1.2%)
- Arabic	-
- Other	-
Children Living at Home (N) (%)	
- No	141 (87%)
- Yes	21 (13%)
Duration of Diabetes (av. years) (SD) *(missing 9)*	10.18 (8.004)
Medication for Diabetes (N) (%) *(missing 2)*	
- No	20 (12.5%)
- Yes	140 (87.5%)
Insulin Use (N) (%)	
- No	136 (84%)
- Yes	26 (16%)
Diabetes-related Complications (N) (%) *(missing 1)*	
- No	142 (88.8%)
- Yes	18 (11.3%)
Partner at home (N) (%)	
- No	87 (53.7%)
- Yes	75 (46.3%)
HbA1c (av./SD)mmol/mol	53 (11.61)
Beck's Depression Inventory (BDI) (av./SD)	8.9 (9.44)
Diabetes Distress Scale (DDS) (av./SD)	
- Physician-related Distress	1.3 (.622)
- Emotional Burden	1.8 (1.07)
- Regimen-Related Distress	1.9 (1.03)
- Interpersonal Distress	1.43 (.904)
- Total	1.6 (.782)

Table 2: Pearson's Correlations for Depression across each Diabetes Distress Subscale

	Depression
Physician-related distress	.286***
Emotional Burden	.701***
Interpersonal Distress	.516***
Regimen-related distress	.649***

***p < .05. **p < .01. ***p < .001.**

Table 3: Mean Scores, ANOVA results and Effect Sizes between Clusters

	Mean scores/ Standard deviations								**Effect sizes for the difference between clusters (eta-squared/ ηp^2)**
	Cluster 1 (n= 23)		**Cluster 2 (n=68)**		**Cluster 3 (n=71)**		**F**	**P**	
Gender	.43	.507	.34	.477	.31	.466	.598	.551	.007
Age	65.32	10.030	68.69	11.903	68.85	9.995	.964	.384	.012
Duration of Type 2 Diabetes	12.381	8.7663	9.138	7.4593	10.512	8.2316	1.418	.245	.019
Medication	.91	.294	.82	.386	.92	.280	1.547	.216	.019
Insulin	.17	.388	.13	.341	.18	.390	.345	.709	.004
Complications	.26	.449	.06	.239	.11	.320	3.561	.031*	.043
HbA1c	54.024	9.2611	52.397	11.1745	53.921	12.8661	.337	.715	.004
Depression	16.52	11.369	5.21	4.622	10.93	8.674	21.062	.000***	.209
IPQ-R Identity	6.83	1.586	.71	.947	1.92	1.500	188.850	.000***	.704
IPQ-R Timeline Acute/Chronic	19.26	3.018	19.24	5.373	18.32	2.377	1.056	.350	.013
IPQ-R Consequence	20.70	4.247	14.96	2.617	17.82	3.191	32.723	.000***	.292
IPQ-R Personal Control	19.39	2.726	20.43	2.153	20.30	2.308	1.793	.170	.022
IPQ-R Treatment Control	13.35	3.419	14.24	1.805	14.00	1.773	1.548	.216	.019
IPQ-R Illness	13.57	4.708	12.81	4.936	14.03	3.295	1.435	.241	.018

Coherence									
IPQ-R Timeline Cyclical	12.17	4.119	7.07	2.384	11.86	3.361	48.110	.000***	.377
IPQ-R Emotional Representations	18.52	5.299	12.24	3.158	15.30	3.874	26.046	.000***	.247
IPQ-R Emotional Cause	15.1304	5.58655	11.3088	3.81379	13.7324	5.02837	7.780	.001**	.089
IPQ-R Behavioural Cause	12.6087	3.18718	10.6029	3.21906	11.3662	3.24363	3.449	.034*	.042
IPQ-R External Cause	17.3478	4.45797	16.7353	3.92701	17.5775	4.33808	.721	.488	.009
Physician-related Distress	1.5000	.95644	1.1801	.40252	1.4542	.89773	2.954	.055	.036
Emotional Burden	3.0261	1.52709	1.2882	.39456	2.0366	.97823	34.413	.000***	.302
Regimen-related Distress	2.9478	1.58655	1.4654	.63665	2.0507	1.11341	18.564	.000***	.189
Interpersonal Distress	2.4203	1.62747	1.1324	.42771	1.6056	.95171	17.438	.000***	.180
Diabetes Distress Total	2.4736	1.25073	1.2666	.31243	1.7868	.85318	23.253	.000***	.226
DAS Consensus	22.00	9.244	25.53	3.544	23.80	5.276	2.677	.074	.051
DAS Satisfaction	15.00	4.472	16.38	2.749	16.02	2.592	1.069	.347	.021
DAS Cohesion	10.25	4.555	10.40	4.004	10.14	4.470	.045	.956	.001
DAS Total	47.25	16.086	52.64	7.197	49.95	9.826	1.818	.168	.035

[Effect Size is eta-squared (ηp^2); *p<0.05; **p<0.01; ***p<0.001]

Table 4: Summary of each Separate regression across Outcome Measures

	Emotional Burden		**Regimen-related Distress**		**Interpersonal Distress**		**Physician-related Distress**	
	βeta	p	βeta	p	βeta	p	βeta	p
Gender	.087	.317	.162	.052	.144	.213	**.244**	**.018***
Age	**-.226**	**.026***	-	-	-	-	-	-
Duration of Type 2 Diabetes	**.272**	**.007****	-.003	.970	.081	.481	-.151	.137
Medication	-	-	.129	.118	-	-	.157	.126
Insulin	.092	.322	-	-	-	-	-	-
PartnerHasDiabetes	-.056	.529	-	-	-.138	.225	-	-
ChildrenLivingAtHome	-	-	-	-	-	-	-	-
Complications	-	-	-	-	.038	.739	-	-
Cluster1 versus Cluster 2	-	-	-	-	**.446**	**.000*****	.148	.169
Cluster3 versus Cluster 2	-	-	-	-	**.249**	**.036***	.060	.566
Cluster1 versus Cluster 3	**.395**	**.000*****	**.359**	**.000*****	-	-	-	-
Cluster2 versus Cluster 3	**-.341**	**.000*****	-.097	.259	-	-	-	-
DAS Consensus	**-.205**	**.036***	**-.402**	**.000*****	-	-	-	-
DAS Satisfaction	.142	.137	.026	.798	-	-	.181	.108
DAS Cohesion	-	-	-.158	.090	**-.255**	**.028***	**-.282**	**.013***

[Significant predictors highlighted in bold *p<0.05; **p<0.01; ***p<0.001]